

Ultrasonic Additive Manufacturing for Multifunctional Structural Materials with Embedded Capabilities, Phase I

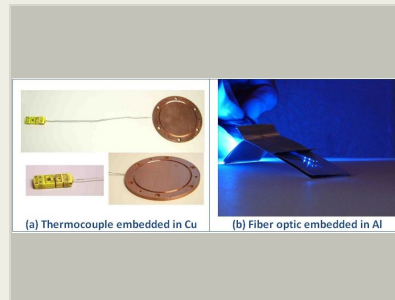
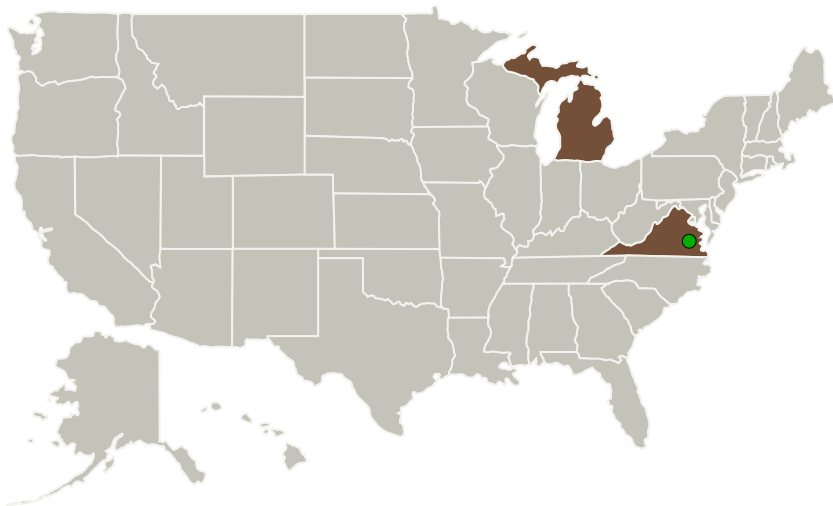
Completed Technology Project (2015 - 2015)



Project Introduction

The goal of this Phase I SBIR program is to demonstrate the use of Ultrasonic Additive Manufacturing (UAM) solid state metal 3D printing to manufacture multifunctional structural components with embedded sensors such as strain gauges, break wires, and thermocouples. Specifically, this Phase I SBIR effort will demonstrate technical feasibility and test proof of concept for: ** 3D printing structural aluminum components with embedded thermocouples; ** 3D printing structural aluminum components with embedded strain gauges for structural health monitoring; ** 3D printing structural aluminum components with grids of break wires for damage sensing and tracking. Ultrasonic Additive Manufacturing has potential to uniquely advance technology readiness levels of multifunctional materials for structural components with embedded capability for sensing strain, damage initiation and propagation, and temperature. By combining two functions (structure/sensing) it will be shown that a lighter weight, higher performance solution can be built in a shorter time period. Successful proof of concept of these innovations and elevation of one specific application to TRL 5 will be accomplished in Phase I. With NASA guidance, the project team Phase II plan is to select and develop functional prototype structures with the Phase I results that best increase mission capability with decreased mass. A demonstration unit will be delivered to NASA for testing at the completion of the Phase II contract.

Primary U.S. Work Locations and Key Partners



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Organizations Performing Work	Role	Type	Location
Sheridan Solutions, LLC	Lead Organization	Industry Veteran-Owned Small Business (VOSB)	Saline, Michigan
● Langley Research Center(LaRC)	Supporting Organization	NASA Center	Hampton, Virginia

Primary U.S. Work Locations

Michigan	Virginia
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Project Transitions

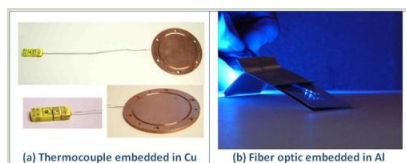
**June 2015:** Project Start**December 2015:** Closed out

Closeout Summary: Ultrasonic Additive Manufacturing for Multifunctional Structural Materials with Embedded Capabilities, Phase I Project Image

Closeout Documentation:

- Final Summary Chart Image(<https://techport.nasa.gov/file/139406>)

Images



Briefing Chart Image

Ultrasonic Additive Manufacturing for Multifunctional Structural Materials with Embedded Capabilities, Phase I
(<https://techport.nasa.gov/image/130424>)

Organizational Responsibility

Responsible Mission Directorate:

Space Technology Mission Directorate (STMD)

Lead Organization:

Sheridan Solutions, LLC

Responsible Program:

Small Business Innovation Research/Small Business Tech Transfer

Project Management

Program Director:

Jason L Kessler

Program Manager:

Carlos Torrez

Principal Investigator:

John J Sheridan

Co-Investigator:

John T Sheridan

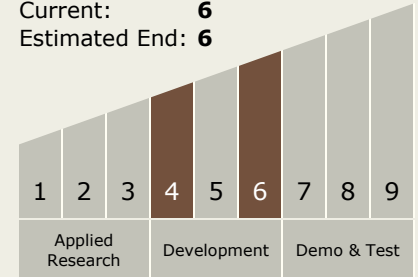
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Technology Maturity (TRL)

Start: 4
Current: 6
Estimated End: 6



Technology Areas

Primary:

- TX12 Materials, Structures, Mechanical Systems, and Manufacturing
 - └ TX12.4 Manufacturing
 - └ TX12.4.1 Manufacturing Processes

Target Destinations

The Sun, Earth, The Moon, Mars, Others Inside the Solar System, Outside the Solar System